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**Terrestrial Isopod Crustaceans from SAIPAN  
Northern Mariana, Micronesia\***

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**北マリアナ連邦サイパン島産陸産等脚目甲殻類**

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北マリアナ連邦サイパン島における陸産等脚目甲殻類の研究は遅れていたが、ドイツのアルシュブラッハ氏による北マリアナ連邦のサイパン島で採集した陸産等脚目甲殻類の標本を見る機会を得ることができ、千葉県立中央博物館の調査標本を見ることもできたので、1999年5月に私自身のサイパンでの短期採集旅行を行い、若干の標本をうることができたので併せて調査した。その結果5科6種を確認し、そのうち、4種は新種であることが判明したので、それぞれ *Ligia saipanensis*, *Alloniscus saipanensis*, *Alloniscus allspachi* ならびに *Burmoniscus bicolor* として記載した。

キーワード：サイパン、等脚目、新種、ワラジムシ、フナムシ、タマワラジムシ、ヒメワラジムシ

Hitherto, taxonomical studies on terrestrial isopods have been much ignored in Saipan, North Mariana Islands. Recently, I could examine some specimens caught by Mr. Andreas Allspach and I have an opportunity to examine the isopod specimens of the Natural History Museum and Institute, Chiba. Adding this, I made a small trip to Saipan in 1999. the result of these studies of mine, 6 species belonging to 5 families have been recorded of them and 4 species were proved to be new to science: *Ligia saipanensis*, *Alloniscus saipanensis*, *Alloniscus allspachi*. and *Burmoniscus bicolor*.

Key words: Saipan, Northern Mariana, Isopods, New species, *Ligia saipanensis*, *Alloniscus saipanensis*, *Alloniscus allspachi*, *Burmoniscus bicolor*

**Study sites and materials**

All the sampling sites are shown in Fig.1. Almost all the specimens including the holotypes are deposited at the Toyama Science Museum, at the Senckenberg-Museum Frankfurt/Main (SMF) and the Natural History Museum and Institute, Chiba (CPM).

**Results**

As the result of the study, six species belonging to 5 families have been recorded. But some species were not enough to clarify thoroughly on taxonomical and biogeographical studies on the terrestrial isopod crustaceans in Saipan. Therefore, accurate identifications may well be left to the study of future.

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\*Contribution from Toyama Science Museum No.246

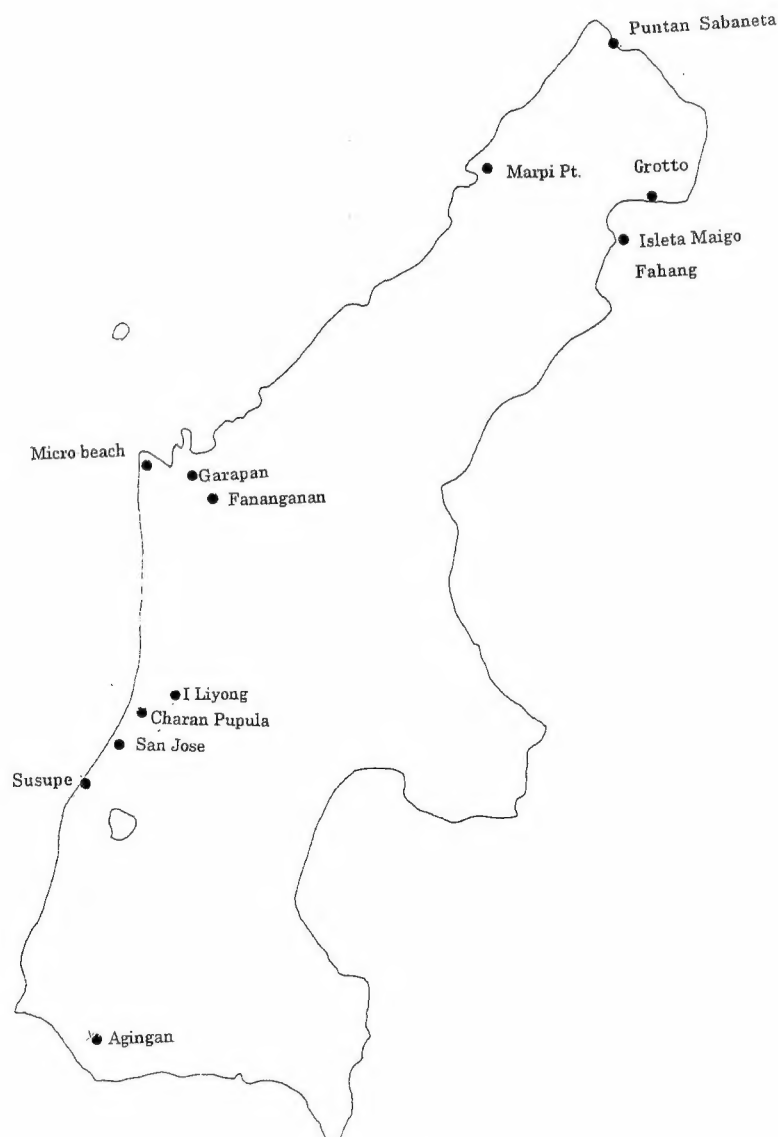


Fig. 1 Map showing the main collecting sites, Saipan Island.

### Family Ligiidae

*Ligia saipanensis* sp. nov.

(Fig. 2).

**Material examined:** Marpe, on rock, May, 1999, 6♂♂ (1♂ holotype, 10.5 mm in body length, and 5♂♂ paratypes, 6.2~10.4mm in body length) and 8♀♀ (1♀, allotype, 9.6 mm in body length and 7♀♀ paratypes, 6.2~10.4mm in body length), coll. Noboru. Nunomura. Holotype (TOYA Cr-12761), allotype (TOYA Cr-12762) and 5 paratypes (TOYA Cr-12763~12767) at the Toyama Science Museum, 4 paratypes (SMF-23764) at the Senckenberg Museum/Main, Frankfurt and 4 paratypes (CBM ZC-5678) at the Natural History Museum and Institute, Chiba; Grotto, on rocks, 2♂♂ (paratypes, 7.1~8.6mm in body length) and 7♀♀ (paratypes, 10.4~10.8mm in body length), Aug.11, 1990, coll. Andreas Allspach, 9 paratypes (SMF 23763) at the Senckenberg-Museum Frankfurt/Main.)

**Description:** Male. Body 4.2 times as long as wide excluding antennae and uropods. Color grayish green. Eyes big, each eye composed of about 350 ommatidia; posterior border of telson (Fig.2V) with 2 pairs of shallow concavities. Right mandible (Fig. 2F): pars incisiva 3-toothed; lacinia mobilis thin and deeply 2-headed; 5~6 setal rows; processus molaris wide. Left mandible (Fig. 2G): pars incisiva 3-toothed; lacinia mobilis 3-toothed; 5~7 setal rows; processus

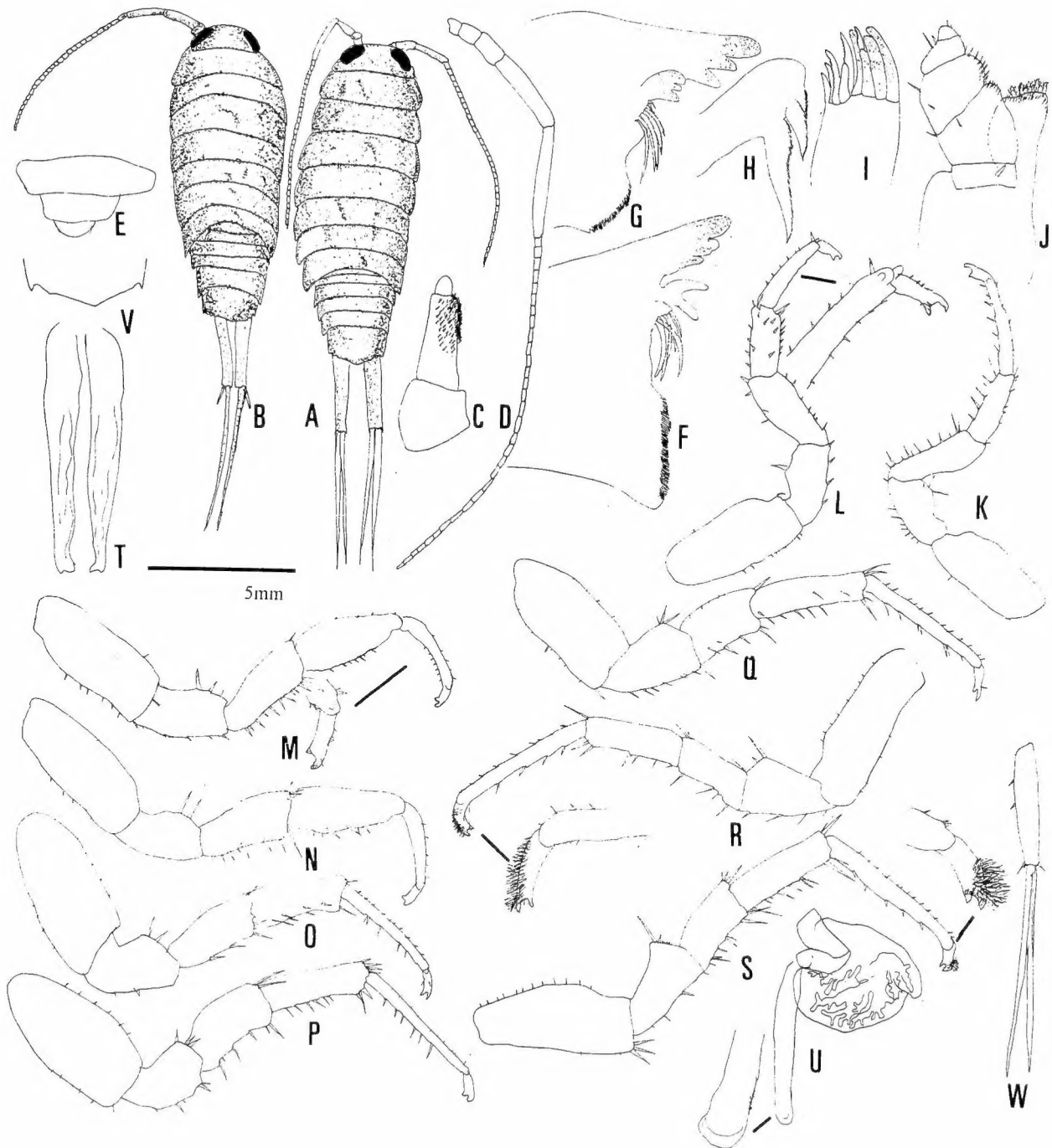


Fig. 2. *Ligia saipanensis* sp.nov.

A: Dorsal view of holotype. B: Dorsal view of a specimen bearing a very short exopod of uropod. C: Antennule. D: Antenna. E: Labrum and labium. F: Right mandible. G: Left mandible. H: Endopod of maxillula. I: Exopod of the same. J: Maxilliped. K: Pereopod of female. L: Pereopod 1 of male. M~Q: Pereopods 2~6. R: Pereopod 7 of female. S: Pereopod 7 of male. T: Penes. U: Male pleopod 2. V: Posterior end of pleotelson. W: Uropod. (A, C-J, L-Q, S-W: Holotype male, B: Paratype male, K and R: Allotype female).

molaris wide. Maxillula (Fig. 2H and I): inner lobe with 3 plumose setae on the distal margin; outer lobe with 10 teeth on the distal margin, outer four teeth stouter and simple, but inner five teeth narrower, with saw-like minute teeth. Maxilla normal type of the genus. Maxilliped (Fig. 2J): endite with 5~6 setae on distal margin; palp with distinct suture lines. Pereopod 1 (Fig. 2L): basis 2.2~2.3 times as long as wide, with 6~7 setae on inner margin; ischium half length of basis; merus as long as ischium, with 12~15 setae on inner margin; carpus 3/4 as long as merus, with about 10 setae on inner margin and 4~6 setae on outer margin; propodus 1.2 times as long as carpus, with 7~10 setae on inner margin, 6~7 setae on outer margin and with a round protuberance on distal margin. Pereopod 2 (Fig. 2M): basis 2.6 times as long as wide, with 5 setae on inner margin and 3 setae on outer margin; ischium 3/5 as long as basis, with 5~6 setae on inner margin and 2 relatively long setae on distal angle; merus as long as ischium, with 12 setae on inner margin and 2 setae at outer distal angle; carpus stout, 5/4 times as long as carpus, with 10-12 setae on inner margin; dactylus long and reaches the basal area of inner margin of carpus. Pereopod 3 (Fig. 2N): basis 2.7 times as long as wide, with 10 setae on inner margin and 4~6 setae on outer margin; ischium half length of basis, with 4 setae on inner margin, a long seta at outer distal angle, and 4~5 setae on distal angle; merus as long as ischium, with 10~11 setae on inner setae, 5~6 setae on distal margin; propodus slightly swollen in medial area, with 13~15 setae on inner margin and 8~10 short setae on outer margin. Pereopod 4 (Fig. 2O): basis with a seta at inner distal angle and 5~7 short setae on both margins; ischium with 5~6 seta on inner margin and 2 long setae at sternal margin; merus 2/3 as long as basis, with 6~7 setae on inner margin and 2 setae at outer distal angle; carpus a little longer than merus, with 5~8 setae on inner margin and 2 setae at outer distal angle; propodus a little longer than carpus, with 4 setae on inner margin. Pereopod 5 (Fig. 2P) ellipsoid, with as relatively long seta at inner distal area and 6~8 setae on both margins; ischium with a long seta at sternal margin; merus with 7~9 setae on inner margin and 3 setae at outer distal area; carpus a little longer than merus, with 3 setae on inner margin and 4 setae at outer distal area; propodus times longer than carpus, with 4 stout setae on inner margin and 6~7 setae on outer margin. Pereopod 6 (Fig. 2Q): basis stout with a seta at inner distal area and 4~8 small setae on both margins; ischium with a group of setae medial area of inner margin and 1~2 setae on inner distal area, 2 setae at sternal margin; carpus as long as ischium, with 8 setae on inner margin and 2 setae at outer distal area; carpus a little longer than merus, with 6~7 setae on inner margin and 2~3 setae at outer distal area; propodus 1.3 times as long as carpus with 8 setae on inner margin and 16~19 short setae on outer margin. Pereopod 7 (Fig. 2S): basis stout, about 2.5 times as long as wide, with 7 short setae on outer margin; ischium a little shorter than basis, with setae on inner margin and 2~3 setae on outer margin; merus a little shorter than ischium, with 8 setae on inner margin and 3 setae at outer distal angle; carpus 1.4 times as long as merus, with 4 setae on inner margin and 6~7 setae on dorsal margin; propodus 1.4 times as long as carpus, with 7 setae on inner margin and 15-17 setae on outer margin. Penes (Fig. 2T): paired and straight; relatively short. Pleopod 2 (Fig. 2U): endopod straight apical area round, with wide groove; exopod round. Uropod (Fig. 2W) long 70~73% as long as body: basis long, 5 times as long, as wide: exopod 1.9 to 2.0 times as long as basis; endopod a little shorter than exopod.

Female. Pereopod 1 without any protuberance on dactylus (Fig. 2K), and less setose on dactylus of pereopod 7 (Fig. 2R), shorter. One gravid female (body length 10.3mm) with 23 eggs in her brood pouch.

Etymology: This species is named after the type locality.

Remarks: The present new species is most closely allied to *Ligia yamanishii* Nunomura, 1990, recorded from Bonin Islands, but the former is separated from the latter by the following features: (1) shorter basis of uropod, (2) shorter and less numerous flagellum of antenna, (3) rounded apical area of male second pleopod, (4) presence of hair on dactylus, (5) less numerous setal row of mandible, (6) shallower concavity of posterior margin of pleotelson.

I collected a queer looking male specimen from Marpi (Fig. 2B), which had a very short exopod of uropod. It is considered to be a kind of terata, because other features are almost same as the holotype.

**Family Scyphacidae**

*Alloniscus saipanensis* sp. nov.

(Fig. 3)

*Material examined:* Liyang, 11 ♂♂ (1 ♂ holotype, 6.9mm in body length and 10 ♂♂ paratypes, 4.9~6.9mm in body length and 21 ♀♀ (1 ♀ allotype, 5.9mm in body length and 20 ♀♀, paratypes 4.5~7.0mm in body length), May 16, 1999 coll. Noboru Nunomura, Type series is deposited as follows: Holotype (TOYA Cr-12770), allotype (TOYA Cr-12771) and 14 paratypes (TOYA Cr-12772~12785) at the Toyama Science Museum, 8 paratypes (SMF-23770) at the Senckenberg-Museum Frankfurt/Main and 8 paratypes (CBM ZC-5676) at the Natural History Museum and Institute, Chiba.

Other specimens: Puntan Sabantea (Banzai cliff), May 17, 1999, 1 ♀ coll. Noboru Nunomura; Garapan, 1 ♀, May 17, 1999, coll. Noboru Nunomura.

*Description:* Male. Body ellipsoid, 1.7 times as long as wide. Color dull gray, with many irregular darker patterns on dorsal surface. Eyes, each eye with 15 ommatidia. Antennule (Fig. 3B) with 7 aesthetascs at tip. Antenna (Fig. 3C) reaches the anterior half of pereonal somite 2; 3 flagellar segments almost equal in length. Right mandible (Fig. 3D): pars incisiva 3-headed; lacinia mobilis weakly 2-toothed; processus molaris represented by a single plumose seta. Left mandible (Fig. 3E): pars incisiva 3-headed; lacinia mobilis 4-toothed; processus molaris represented by a single plumose seta. Maxillula (Fig. 3F): inner lobe with 2 plumose setae at tip; outer margin with 7 teeth at tip, inner most 2 setae with a small denticles. Maxilla (Fig. 3G) wide, with many setae. Maxilliped (Fig. 3H): endite rectangular, with a stout seta on inner distal area and many small denticles on distal margin; palp stout, segment 1 with 2 setae terminal segment with many small setae at tip. Pereopod 1 (Fig. 3I) shorter than the other pereopods: basis 2.5 times as long as wide, with 15~17 short setae on inner margin and a seta at inner distal angle; ischium 3/5 as long as basis with 11 setae on inner margin and 5 setae on outer distal area; merus a little shorter than ischium, with 16~18 setae on inner margin and 2 longer setae at outer distal margin; carpus a little longer than merus, with 11~13 setae on inner margin, 2 setae at outer distal angle and many setae on lateral sides; propodus 2/5 as long as carpus, with 8 short setae on inner margin and 9~10 setae on outer margin. Pereopod 2 (Fig. 3J): basis 4 times as long as wide, with 15~16 setae on inner margin and 3~5 setae on outer margin; ischium half length of basis, with 11~13 setae on inner margin and 4~5 setae on sternal margin; merus almost as long as ischium, with 13 setae on inner margin and 9~10 setae on outer margin; carpus 1.5 times as long as merus, with 10 setae on inner margin and 12 setae on outer margin; propodus 2/5 as long as carpus with 4 setae on inner margin. Pereopod 3 (Fig. 3K): basis 3.3 times as long as wide, with 11~12 setae on inner margin and 3 setae on outer margin; ischium half length of basis, with more than 20 setae on inner area and 4 setae on sternal margin; merus a little shorter than ischium, with 12~20 setae on inner margin and 8~10 setae on outer margin; carpus as long as ischium, with 14~17 setae on inner margin and 6~10 setae outer margin; propodus about half length of carpus with 5 setae on inner margin and 6 setae on outer margin. Pereopod 4 (Fig. 3L): basis 3.4 times as long as wide, with a long seta at inner distal angle; ischium 2/3 as long as basis, with 8~10 setae on inner margin and 7~8 setae on outer margin; merus a little shorter than ischium, with 11~12 setae on inner margin 2~3 setae on outer distal area and 10 setae on outer distal area; carpus as long as merus, with 15~17 setae on inner margin including long one on distal area, 10~12 setae on outer margin and 4~5 setae on distal margin; propodus with 3~4 setae on inner margin and 5~6 setae on outer margin. Pereopod 5 (Fig. 3M): basis 3.0 times as long as wide, with 17~20 short setae on inner margin, a long seta at inner distal angle and about 10 setae on outer margin; ischium about half length of basis, with 10 setae on inner margin, 6-8 setae on outer margin; merus 2/5 as long as basis, with 18~21 setae on inner margin, 8~10 setae on outer margin; carpus as long as merus, with 12~14 setae on inner margin, 7~8 relatively long setae on distal margin, and about 10 setae on outer margin; propodus 4/5 as long as carpus, with 6 setae on inner margin. Pereopod 6 (Fig. 3N): basis 2.6 times as long as wide, with a series of 8~9 short setae near inner margin and a seta at inner distal angle; ischium 3/5 as long as basis with 8~10 setae on inner margin and 4 setae on sternal margin; merus 2/3 as long as ischium, with 20 setae on inner margin and 3 stouter setae along inner margin, 8 setae on outer margin and 7~8 setae on distal margin; carpus 5/4 times



as long as merus, with 14~18 setae on inner margin, 2~3 setae along inner margin, 10 setae on outer margin, 7~8 setae along outer margin, and 3 setae distal margin; propodus as long as merus, with 7~8 setae on inner margin, 10~12 setae along inner margin and 12 setae on outer margin. Pereopod 7 (Fig. 3O): basis 2.4 times as long as wide, with 7~8 setae on inner margin; ischium 2/3 as long as basis, with 13~15 setae on inner margin, and 5 longer setae on sternal margin and 5~6 setae on outer margin; merus as long as ischium, with a protuberance near the basal area of inner margin, bearing many short setae and 12~14 setae on inner margin and 2 setae near the outer distal area; carpus long as merus, with 10 setae on inner margin and 4 setae on distal margin; propodus 4/5 as long as merus, with

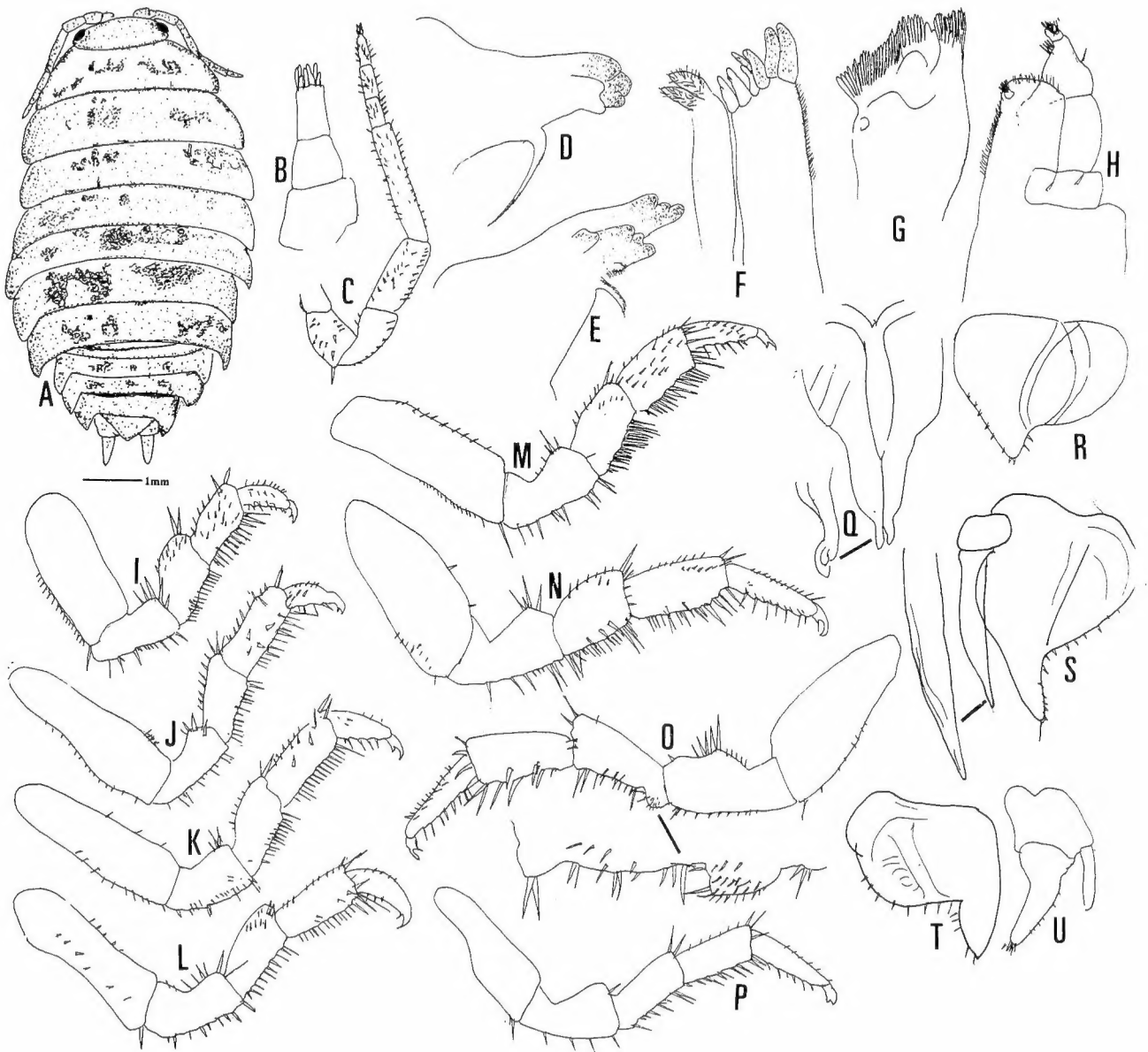


Fig. 3. *Alloniscus saipanensis* sp. nov.

A: Dorsal view. B: Antennule. C: Antenna. D: Right mandible. E: Left mandible. F: Maxillula. G: Maxilla. H: Maxilliped. I~N: Pereopods 1~6. O: Male pereopod 7. P: Female pereopod 7. Q: Penes and endopod of male pleopod 1. R: Exopod of the same. S: Male pleopod 2. T: Pleopod 4. U: Uropod. (A-O, Q-U: Holotype male, P: Allotype female).

8 setae on inner margin and 11~13 setae on outer margin. Penes (Fig. 3Q) fusiform. Pleopod 1 (Fig. 3Q and R): endopod straight, apical area swollen semicircular. Pleopod 2 (Fig. 3S): endopod straight but relatively short, exopod triangular, with a shallow concavity and 17~18 small spines on outer margin. Pleopod 4 (Fig. 3T): rectangular, with protruded inner part. Uropod (Fig. 3U): basis almost square; endopod rather stout, a little wider than long, 1.5 times as long as wide; exopod narrow, 1.5 time as long as endopod.

Female: Roughly similar to male except copulatory apparatus. One gravid female (body length 7.0mm) bears 16 eggs in her brood pouch.

Etymology: Saipan is the name of islands, type locality.

Remarks: The present new species is most closely allied to *Alloniscus boninensis* reported from Bonin Islands but differs from the latter by the following features: (1) protuberance of male pleopod 1, (2) shorter endopod of male pleopod 2, (3) less numerous teeth on the tip of outer lobe of maxillula, (4) lack of bifid type setae on pereopods, (5) more aesthetascs on the tip of antennule, (6) single plumose setae of both processus molaris of mandibles and (7) lacks of protuberance on male pereopod 7. The present new species is also allied to *A. ryukyuensis* Nunomura, reported from Ryukyu Islands, but is separated from the latter in the following features: (1) protuberance of male pleopod 1, (2) shorter endopod of male pleopod 2, (3) less numerous teeth on tip of outer lobe of maxillula, (4) lacks of bifid type setae on pereopods, (5) single plumose seta of both processus molaris of mandibles. (6) lack of protuberance on male pereopod 7 and (7) pointed posterior margin of pleotelson.

*Alloniscus allspachi* sp.nov.

(Fig. 4)

Material examined: Garapan, Micro Beach at the Bay north of Garapan, Needle-wood, under Stones, 4♂♂ (1 ♂ holotype, 6.1mm in body length and 3♂♂, paratypes, 1.9~5.8mm in body length) and 7♀♀ (1 ♀ allotype, 5.6mm in body length and 6♀♀ paratypes, 4.5~5.3mm in body length), Aug. 9, 1990, leg. Andreas. Allspach; Holotype (SMF 23765), allotype (SMF 23766) and 7 paratypes (SMF 23767) at Senckenberg-Museum Frankfurt/Main) and 3 paratypes at the Toyama Science Museum (TOYA Cr-12786~12788); Garapan, Micro Beach at the Bay north of Garapan, under Stones and grass, 1♂ (5.7mm in body length) 7♀♀ (4.9~6.4mm in body length) 10. August 1990, leg. A. Allspach. paratypes (SMF 23768) at Senckenberg-Museum Frankfurt/Main) and 2 paratypes (TOYA Cr-12789~12790) at the Toyama Science Museum. Micro beach, at the Bay north of Garapan, under alluvial seaweed, 11♂♂ (2.8~5.7mm in body length) and 9♀♀ (2.9~4.3mm in body length) and 23 young or broken specimens, Aug.12, 1990, coll. Andreas Allspach, 15 paratypes (SMF 23769) at Senckenberg-Museum Frankfurt/Main) and 5 paratypes (TOYA Cr-12791~12795) at the Toyama Science Museum;

Description: Body 2.0 times as long as wide. Color creamy white, with irregular darker patterns on dorsal surface. Antennule (Fig. 4B): 3-segmented and relatively short; terminal segment with 5~6 aesthetascs at tip. Antenna (Fig. 4C) reaching at the posterior margin of pereonal somite 2; flagellum 3-segmented and mutual length of is 5: 3: 5. Right mandible (Fig. 4D): pars incisiva 3-headed; lacinia mobilis 2-headed; 5~6 setal rows; processus molaris represented by a long plumose seta. Left mandible (Fig. 4E): pars incisiva 4-headed; lacinia mobilis 2-headed; 6~10 setal rows; processus molaris represented by a long plumose seta. Maxillula (Fig. 4F): inner lobe with 2 plumose setae at the tip; outer lobe with 10 teeth, four of them bifurcated. Maxilla (Fig. 4G) wide and 2-headed, with many setae. Maxilliped (Fig. 4H): endite round, without spurs; palp distinctly 4-segmented. Pereopod 1 (Fig. 4I): basis 2.3 times as long as wide; ischium 45% as long as basis, with 6~8 setae on inner margin and 2 setae on outer margin; merus a little longer than ischium, with 7~8 setae on inner margin and 1~2 setae at outer distal angle; carpus almost as long as ischium, with 4~5 longer setae on distal half of inner margin, 5 setae on basal half of the same, 5~6 setae on outer margin and many finer setae on inner area; propodus 3/4 as long as carpus, with 4 setae on inner margin, 8~9 setae on outer margin and several short setae on lateral margin. Pereopod 2 (Fig. 4J): basis 2.5 times as long as wide; ischium 2/5 as long as basis, with 5~6 setae on inner margin and a seta at sternal margin; merus as long



as ischium with 13~14 setae on inner margin and 1 or 2 setae at outer distal angle; carpus a little longer than merus, with 10 setae on inner margin and 2 longer and 2~3 shorter setae at outer distal angle; propodus  $2/3$  as long as carpus, with 6 setae on inner margin and 10 setae on outer margin; dactylus with a sensory seta. Pereopod 3 (Fig. 4K): basis 2.7 times as long as wide; ischium  $3/4$  as long as basis, with 6 setae on inner margin and 2~3 setae at outer distal angle; merus as long as ischium, with 6 setae on inner margin and a seta at outer distal angle; carpus 1.3 times as long as merus, with 15~16 setae on inner margin and a seta at outer distal angle; propodus a little longer than carpus, with 7 setae on inner margin and 7~10 setae on outer margin. Pereopod 4 (Fig. 4L): basis 2.6 times as long

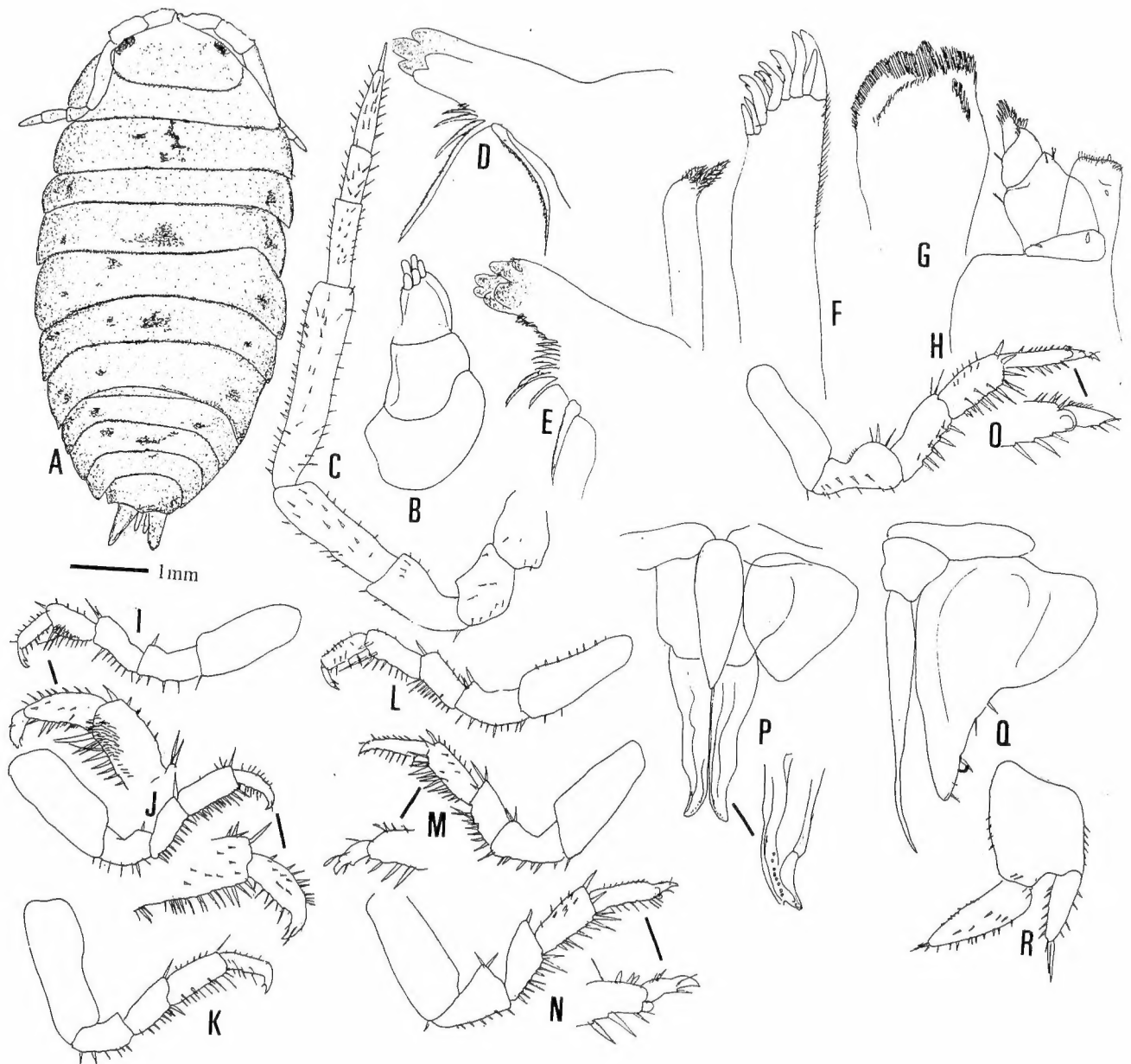


Fig. 4. *Alloniscus allspachi* sp. nov

A: Dorsal view. B: Antennule. C: Antenna. D: Right mandible. E: Left mandible. F: Maxillula. G: Maxilla. H: Maxilliped. I~O: Pereopods 1~7. P: Penes and male pleopod 1. Q: Male pleopod 2. R: Uropod (All: Holotype male).

as wide, with 3~4 setae on inner margin and 8 setae on outer margin; ischium half length of basis, with 9~10 setae on inner margin and 2 setae on outer margin; merus a little shorter than ischium, with 9~11 setae on inner margin and 4~5 setae on outer margin and a long seta at outer distal angle; carpus 1.2 times as long as merus, with 4~5 setae on inner margin and 5-6 setae on outer margin; propodus almost as long as merus, with 4 setae on inner margin and 7~8 setae on outer margin. Pereopod 5 (Fig. 4M): basis 2.2 times as long as wide, with a long seta at inner distal angle; ischium  $3/5$  as long as basis, with 7 setae on inner margin and 4~5 setae on outer distal area; merus  $2/3$  as long as ischium, with 9~10 setae on inner margin and 3 setae on distal outer area; carpus 1.5 times as long as merus, with 10~12 setae on inner margin and 3 setae at outer distal area; propodus  $4/5$  as long as carpus, with 10 setae and 5~6 seta on outer margin. Pereopod 6 (Fig. 4N): basis 2.5 times as long as wide, with a seta at inner distal angle; ischium  $2/3$  as long as basis, with 9~12 setae on inner margin and 2 setae at sternal margin; merus  $2/3$  as long as ischium, with 9~10 setae on inner margin and a seta at outer distal margin; carpus a little longer than merus, with 8 relatively long setae on inner margin and 2 setae; propodus as long as merus, with 7~8 setae on inner margin and 10~12 setae on outer margin. Pereopod 7 (Fig. 4O): basis 3.1 times as long as wide, with a seta at inner distal angle; ischium  $3/4$  as long as basis, with  $4/5$  as long as wide, with 7~8 setae on inner margin and 2 setae at outer distal angle; carpus as long as merus, with 10~11 setae on inner margin, 2 setae on distal margin and many short setae on outer margin; propodus almost as long as carpus, with 6~7 setae on inner margin and 12~13 setae on outer margin. Penes (Fig. 4P) fusiform and rather stout, its tip is pointed. Pleopod 1 (Fig. 4P) almost straight but tapering toward the tip and outmost area bending toward the outward, with about 10 denticles; exopod triangular. Pleopod 2 (Fig. 4Q): endopod straight and tapering towards the tip; exopod ellipsoid. Uropod (Fig. 4R): basis almost square; endopod 0.9 time as long as basis; exopod  $2/3$  as long as endopod with a tuft of setae at tip.

Female: Roughly similar to male except copulatory apparatus.

Etymology: The species name is dedicated to Mr. Andreas Allspach, collector of the species.

Remarks: The present new species is separated from another species, *Alloniscus saipanensis* Nunomura, from Saipan already described in this paper by the following features: (1) pointed (not swollen) tip of endopod of male pleopod 1, (2) longer endopod of male pleopod 2, (3) more teeth on outer lobe of maxillula, (4) lacks on protuberances on merus of male pereopod 7, (5) less numerous aesthetascs of antennule, and (6) shape of pleotelson.

### Family Philosciidae

*Burmoniscus bicolor* sp. nov.

(Fig. 5)

*Material examined*: East of Garapan, 6 ♂♂ (1 ♂ holotype, 3.6mm in body length and 5 ♂♂ paratypes, 3.5~3.9 mm in body length) and 4 ♀♀ (1 ♀ allotype, 6.4mm in body length and 3 ♀♀ paratypes, 4.5~4.7mm in body length) May 17, 1999, coll. Noboru Nunomura. Type series is deposited as follows: Holotype (TOYA Cr-12796), allotype (TOYA Cr-12797) and 4 paratypes (TOYA Cr-12798~12801) at the Toyama Science Museum; 2 paratypes (SMF 23771) at the Senckenberg-Museum Frankfurt-Main.; 2 paratypes (CBM-ZC 5677) at the Chiba Museum and Institute.

*Description*: Body 2.1 times as long as wide. Color of dorsal side brown with wide white area; uropods with 2 paler bands. Cephalon elliptical. Eyes big, each eye with 12~13 ommatidia. Antennula (Fig. 5C): terminal segment bears 2 aesthetascs at tip and 2 aesthetascs on lateral margin. Antenna (Fig. 5D) long and reaches the pereonite 4; mutual length of 3 flagellar segments is 8: 5: 5. Right mandible (Fig. 5E): pars incisiva 3-toothed; lacinia mobilis not chitinized and weakly 2-headed; 2 setal rows; processus molaris represented by a single plumose seta. Left mandible (Fig. 5F): pars incisiva 3-toothed; lacinia mobilis not chitinized and weakly 2-headed; 2 setal rows; processus molaris represented by a single plumose setae. Maxillula (Fig. 5G): inner lobe with 2 plumose setae at tip and a small acute projection at outer distal angle; outer lobe with 10 teeth at tip, five of them bifurcated. Maxilla (Fig. 5H) wide. Maxilliped (Fig. 5I): endite rectangular, with 2 setae at the inner distal area; palp rectangular with 2 spurs. Pereopod 1 (Fig. 5J): basis 2.2 times as long as wide, ischium  $3/5$  as long as basis, with 3 setae on inner margin and a seta

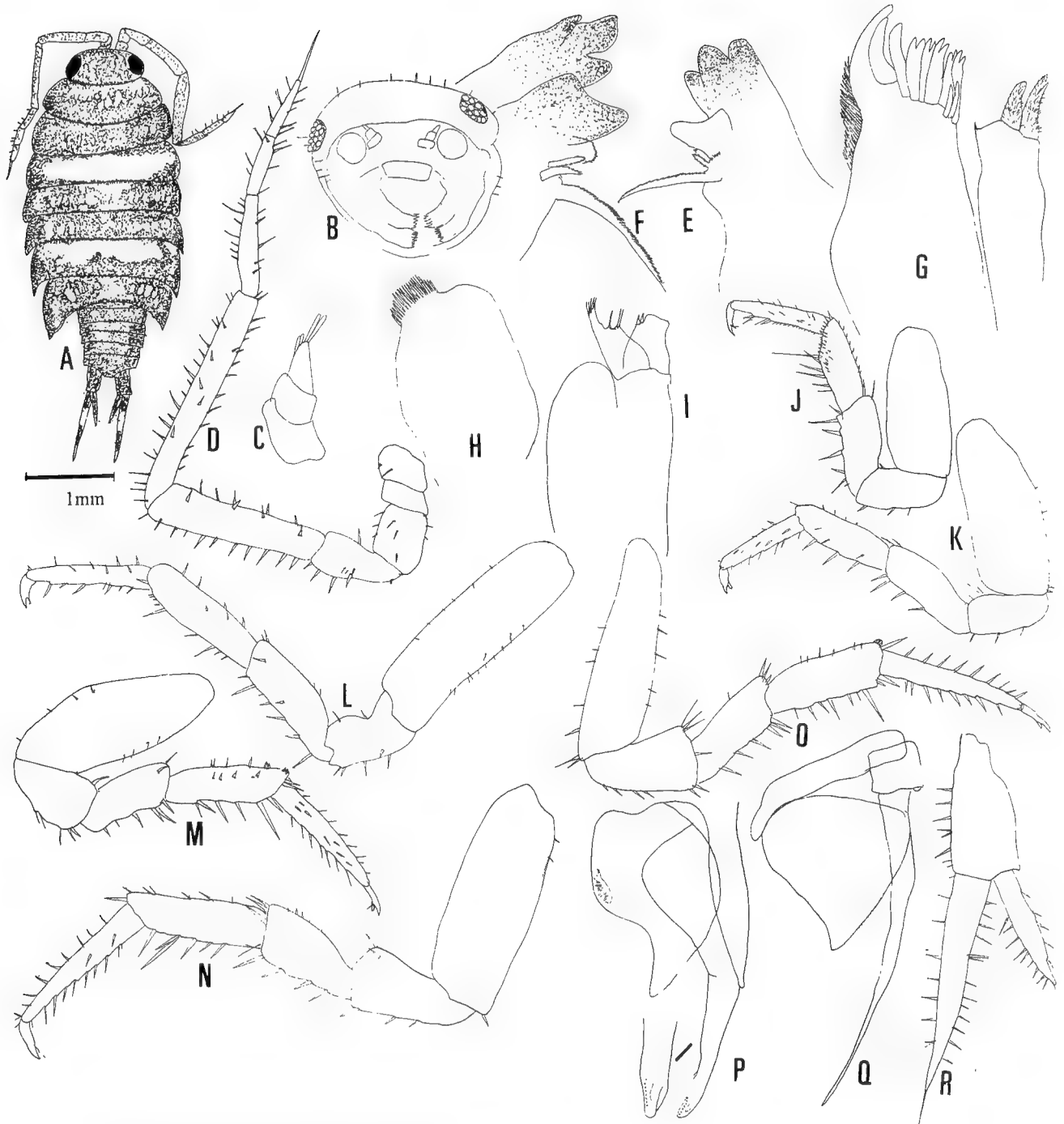


Fig. 5. *Burmoniscus bicolor* sp.nov.

A: Dorsal view. B: Cephalon, frontal view. C: Antennule. D: Antenna. E: Right mandible. F: Left mandible. G: Maxillula. H: Maxilla. I: Maxilliped. J~K: Pereopods 1~2. L~O: Pereopods 4~7. P: Penes and male pleopod 1. Q: Male pleopod 2. R: Uropod (All: Holotype male).

on outer margin; merus with 7 setae on inner margin and 2 setae; carpus as long as merus, with 6 setae on inner margin, including longer one at the distal end, and many short setae on outer distal area; propodus as long as carpus, with a series of many setae on the basal half of inner margin, 2 groups of 2 setae on distal half of inner margin 6~12 setae along outer lobe. Pereopod 2 (Fig. 5K): basis 2.5 times as long as wide; ischium 2/5 as long as basis, with 3 setae on inner margin and 3~4 setae on outer margin; merus half length of basis, with 4 setae on inner margin and 2~3 setae on outer distal angle; carpus as long as merus, with 3 setae on inner margin and 5 setae on outer margin; propodus 4/5 as long as carpus, with 6 setae on inner margin and 6~7 setae on outer margin. Pereopod 3: basis 2.6 times as long as wide; ischium 4/9 as long as basis, with 3~4 setae on inner margin and 1~2 setae on outer margin; merus half length of basis, with longer and 4~5 shorter setae on inner margin; carpus a little longer than merus, with 4~6 setae on inner margin, terminal one longer than others; propodus also a little longer than carpus, with 8 setae on inner margin and 4~6 setae on outer margin. Pereopod 4 (Fig. 5L): basis 3.0 times as long as wide, with 8~10 short setae on both margins; ischium 1/3 as long as basis, with 2 setae on both margins and 3~4 setae at inner distal angle; merus half length of basis, with 7~8 setae on inner margin and 2~3 setae at outer distal angle; carpus a little longer than merus, with 5~6 longer setae on inner margin and 5~7 short setae on distal area of inner margin, and 4~5 setae on outer margin; propodus as long as merus, with 7~9 setae on inner margin and 5~8 setae on outer margin. Pereopod 5 (Fig. 5M): basis 2.7 times as long as wide, 4~5 setae on inner margin and 4~5 setae on outer margin; ischium 2/5 as long as basis, with 5 setae on inner margin and a seta at outer distal angle; merus a little shorter than ischium, with 6~7 setae on inner margin and 2 setae at outer distal angle; carpus 1.5 times as long as merus, with 6~7 setae on inner margin, 5 groups of setae on outer margin; propodus 5/4 times as long as carpus, with 9~10 setae on inner margin and 7 setae on outer margin. Pereopod 6 (Fig. 5N): basis 2.6 times as long as wide, with a seta at inner distal angle; ischium 55% as long as basis, with 3 setae on inner margin and 2 setae on sternal margin; merus 85% as long as ischium, with 5~6 setae on inner margin, 5~6 setae on outer margin and 3 setae on distal outer area; carpus 1.4 times as long as merus, with 6~7 setae on inner margin, 6~8 setae on inner margin; propodus a little longer than carpus, with 10~11 setae on inner margin and 8~12 setae on outer margin. Pereopod 7 (Fig. 5O): basis 3.5 times as long as wide, with 5 setae on both margins and 2 setae at inner distal angle; ischium 3/4 as long as basis, with 5~6 setae on inner margin, 5~6 setae on distal margin; merus a little shorter than ischium, with 6 setae and 3 setae at outer distal angle; carpus as long as ischium, with 7~9 setae on inner margin and 3 setae on distal margin; propodus 1.2 times as long as carpus, with 8 setae and 9 setae on outer margin. Penes (Fig. 5P) fusiform. Pleopod 1 (Fig. 5P): endopod straight with 12~13 spinules near the apical part; exopod semi-circular. Pleopod 2 (Fig. 5P): endopod straight and tapering towards the tip. Uropod (Fig. 5R) long, being 30% as long as body: basis 1.9 times as long as wide, with 8~9 setae on outer margin; endopod long. Position of noduli lateralis on pereonal somites is as follows:.

	d/c	b/c
1	0.35	0.23
2	0.25	0.81
3	0.19	0.55
4	—	—
5	0.13	0.53
6	0.12	0.24
7	0.43	0.09

Female: Roughly similar to male except copulatory apparatus.

Remarks: The present new species is most closely allied to *Burmoniscus boninensis* (Nunomura, 1986) recorded Bonin Islands. But the former is separated from the latter by the following features: (1) shape of exopod of male

pleopod 1, (2) more denticles on endopod of male pleopod 1, (3) color patterns, especially presence of paler area and (4) nearer noduli lateralis of pereonal somite 2.

### Family Trachelipidae

#### *Nagurus* sp.

(Fig. 6)

Material examined: Susupi 3♂♂ (3.4~5.2mm in body length) and 5♀♀ (3.0~3.8mm in body length), Susupi, under stones of roadside, May 18, 1990, coll. Noboru Nunomura. The specimens are deposited at the Toyama Science Museum (TOYA Cr-12803~12810). Other specimens: Garapan, 1♀ (2.6mm in body length), May 16, 1999, Noboru Nunomura; Chalan pupula, 5♀♀ (2.8~3.5mm in body length), May 16, 1999, Noboru Nunomura; Agingan, 1♀ (4.8mm in body length), May 16, 1999, coll. Noboru Nunomura; Fanonchilan, 4♀♀ (3.4~3.8mm in body length), May 16, 1999, coll. Noboru Nunomura.

Description: Body 2.5 times as long as wide. Color brown with paler areas in some specimens (Fig. 6A) but not so remarkable in other specimens. Antennle (Fig. 6C) 3-segmented, terminal segment with 7~8 aesthetascs at tip. Antenna (Fig. 6D) reaches the pereonal somite; flagellum consists of 2 flagellar segments, mutual length is 1: 2. Right mandible (Fig. 6E): pars incisiva 3-headed; lacinia mobilis 3-headed; processus molaris represented by a tuft of setae. Left mandible (Fig. 6F): pars incisiva 3-headed; lacinia mobilis 3-headed; processus molaris represented by a tuft of setae. Maxillula (Fig. 6G): inner lobe with 2 round plumose setae at tip; outer lobe with 10 setae including 4 bifid ones. Maxilla (Fig. 6H) normal. Maxilliped (Fig. 6I): outer lobe with 9 teeth at tip, inner 5 smaller and bifid, and outer 4 bigger and simple; inner lobe with round and 2 plumose setae. Pereopod 1 (Fig. 6J): basis 2.9 times as long as wide, with 8 setae on inner margin and 15 setae on outer margin; ischium half length of basis, with 7~8 setae on inner margin and 2 setae on sternal margin; merus as long as ischium, with many relatively long bifid setae on inner margin, a long seta at outer distal angle and 3 short setae on outer margin; carpus 4/5 as long as merus, with many relatively long bifid setae on inner margin, and 6~7 setae on outer margin; propodus as long as carpus, with many short relatively setae on medial part of inner margin, 2 relatively long bifid setae and a seta on distal area of inner margin, lateralarea and outer margin with relatively short setae. Pereopod 2 (Fig. 6K): basis 3.4 times as long as wide, 9~10 setae on both margins; ischium 9/20 as long as basis, with 6 setae on inner margin and 2 longer setae on outer margin; merus as long as ischium, with 12~14 relatively long setae on inner margin and 2 setae at outer distal angle; carpus as long as merus, with many long bifid setae on inner margin and 5~6 setae on outer margin and 3 setae at outer distal angle; propodus 70% as long as carpus, with 9~10 setae on inner margin and 10~12 setae on outer margin. Pereopod 3 (Fig. 6L): basis 3.4 times as long as wide, 5~6 setae on inner margin; ischium half length of basis, with 4~6 setae on inner margin and a relatively long seta at sternal margin; merus as long as merus, with many long bifid setae on inner margin and 2~3 setae on distal margin; carpus a little longer than merus, with many long bifid setae on inner margin, 5~6 setae on outer margin and 2~3 setae on distal margin; propodus 2/3 as long as carpus, with 5 setae on inner margin, and 8~9 setae on outer margin. Pereopod 4 (Fig. 6M): basis 3.4 times as long as wide; ischium half length of basis, with 2 setae on inner margin and a seta on outer margin; merus a little shorter than ischium, with 11~12 setae on inner margin and 2 setae at outer distal angle; carpus 1.2 times as long as merus with 8 setae on inner margin and 7~10 setae on outer margin; propodus 3/4 as long as carpus with 6 setae on inner margin and 10~12 setae on outer margin. Pereopod 5 (Fig. 6N): basis 3.0 times as long as wide, with a seta at inner distal angle; ischium 55% as long as basis, with 5 short setae on inner margin and 2 setae on outer margin; merus 4/5 as long as ischium, with 6 longer and 6~7 short setae on inner margin and 2 relatively long setae on outer distal angle; carpus 1.2 times longer than merus, with 7~8 setae on inner margin, 4 setae and many minute denticles on distal margin, and 2 setae at outer distal angle; propodus a little longer than carpus with 7~8 setae on inner margin and 7~8 setae on outer margin. Pereopod 6 (Fig. 6O): basis 3.0 times as long as wide; ischium 3/5 as long as basis, with 2 setae on inner margin and 2 long setae on outer margin; merus 4/5 as long as ischium, with 7~8 setae on inner margin and 2 setae at outer distal angle; carpus as long as ischium, with 11~12 setae on inner margin, a seta outer distal

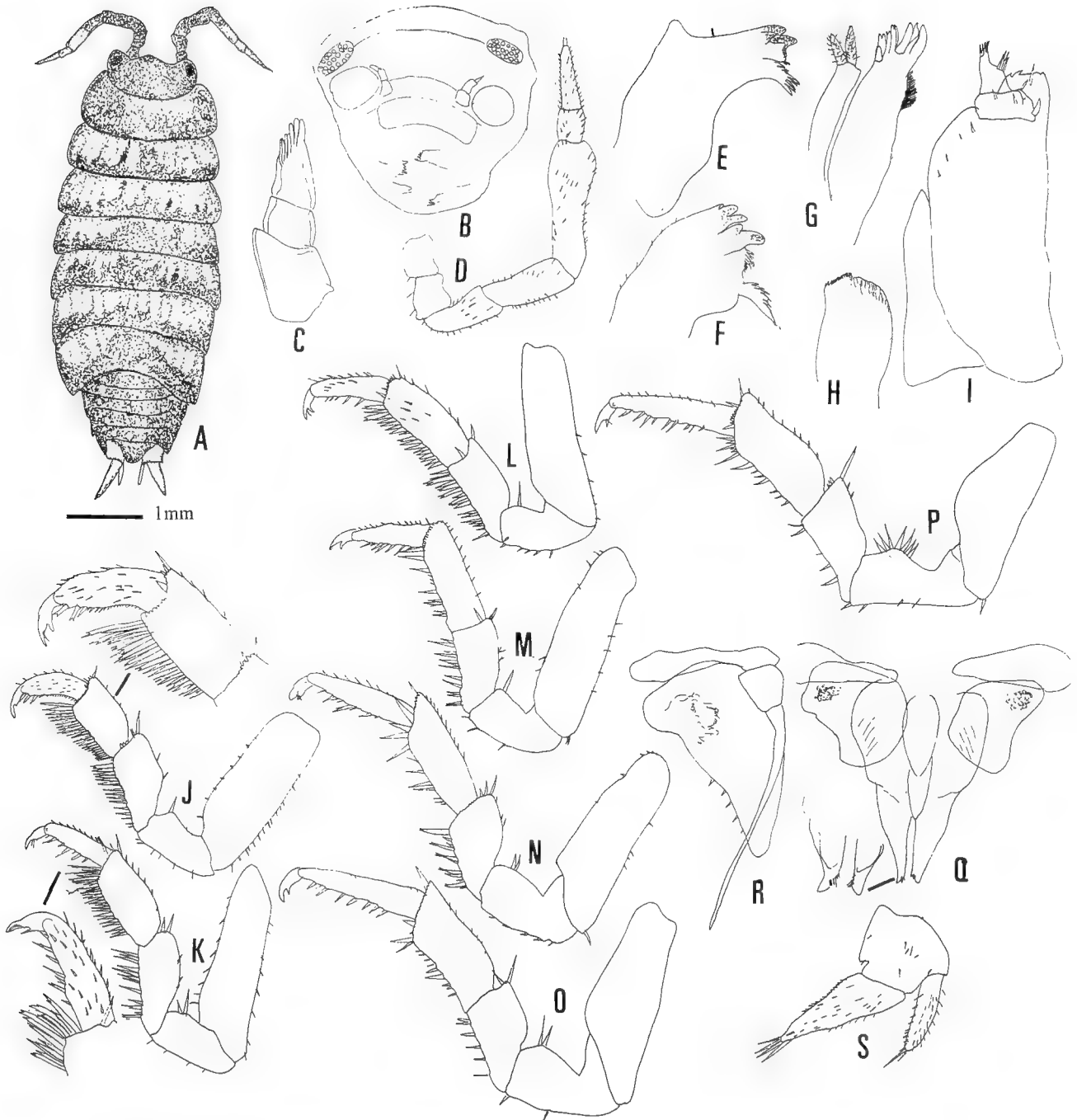


Fig. 6. *Nagurus* sp.

A: Dorsal view. B: Cephalon, frontal view. C: Antennule. D: Antenna. E: Right mandible. F: Left mandible. G: Maxillula. H: Maxilla. I: Maxilliped. J~P: Pereopods 1~7. Q: Penes and male pleopod 1. R: Male pleopod 2. U: Uropod (All: Male from Susupi).



angle and a big seta and many minute denticles on distal margin; propodus as long as carpus, and with 7~8 setae on inner margin. Pereopod 7 (Fig. 6P): basis 2.6 times as long as wide, with a seta at inner distal angle; ischium  $\frac{2}{3}$  as long as basis, with 2~4 setae on inner margin and 7 setae on outer margin; merus 0.7 time as long as ischium, with 6 setae on inner margin and a long seta at outerdistal angle; carpus as long as ischium, with 8~12 setae on inner margin and 3~4 longer setae and many denticles on distal margin; propodus almost as long as carpus, with 9~10 setae on or along the inner margin, and 12 setae on outer margin. Penes (Fig. 6Q) fusiform and rather short. Pleopod 1 (Fig. 6Q); endopod relatively stout, apical part bents outwards slightly bearing 5~6 denticles near the apical part; exopod almost round with a shallow concavity on distal margin. Pleopod 2 (Fig. 6R): endopod long and exceed far beyond the exopod, and tapering toward the tip; exopod triangular, with 3~5 setae on distal margin. Uropod (Fig. 6S): basis almost square; endopod stout, 1.5 times as long as basis, with 5~6 setae at tip; exopod slender than endopod and  $\frac{3}{4}$  as long as endopod, with a tuft of setae at tip. Position of noduli lateralis on pereonal somites of this species is as follows:

	d/c	b/c
1	0.17	0.66
2	0.20	0.49
3	0.20	0.47
4	0.21	0.34
5	0.22	0.25
6	0.22	0.22
7	0.13	0.14

Female: Roughly similar to male except copulatory apparatus.

*Remarks:* The present specimens are placed in the genus *Nagurus* in having without pore on the exopods of pleopod, but different from the typical feature of the genus *Nagurus* in having noduli lateralis near position to lateral margin, this species is most closely allied to *Nagurus okinawaensis* Nunomura, 1992, recorded from Okinawa Island, but is separated from the latter in the following features: (1) presence of only 8 teeth on outer lobe of maxillula, (2) presence of shallow concavity on exopod of pleopod 1, (3) more setae on merus and carpus of pereopods, (4) color patters with wider paler area, (5) more setal rows on mandibles. Due to the fewness of specimens examined, this species can not be properly ascribed to a definite genus until further material is examined.

#### Family Armadillidae

##### *Cubaris* sp.

(Fig. 7)

*Material examined:* Susupi, 1♂ (6.3 mm in body length), May 18, 1999, coll. Nunomura Noboru. This specimen is deposited at the Toyama Science Museum (TOYA Cr-12802)

*Description:* Body 1.9 times as long as wide. Perfectly enrolling. Color dark brown, with many small longitudinal paler patterns. Anterior margin of cephalon long and straight. Pereonal somites 1 and 2 (Fig. 7D) with simple schisma in ventral side. Pleotelson hour-grass-shaped. Antenna reaches posterior area of pereonal somite 1; ration of 2 flagellar segment is 3:7. Right mandible (Fig. 7E): pars incisiva 3-toothed; lacinia mobilis weakly 3-headed; 4 setal rows; processus molaris represented by a single seta. Maxillula (Fig. 7F): inner lobe with 2 rather stout plumose setae at tip; outer lobe with relatively long and simple 11 setae. Maxilla (Fig. 7G) rather narrow. Maxilliped (Fig. 7H): endite with a projection at inner distal angle and a seta near distal margin; first palpal segment with a seta. Pereopod 1 (Fig. 7I): basis 3.9 times as long as wide, with 6~8 short setae on both margins; ischium  $\frac{1}{3}$  as long as basis, with 9~10 on inner margin and a seta at sternal margin; merus a little longer than ischium, with about 25 setae on inner margin;

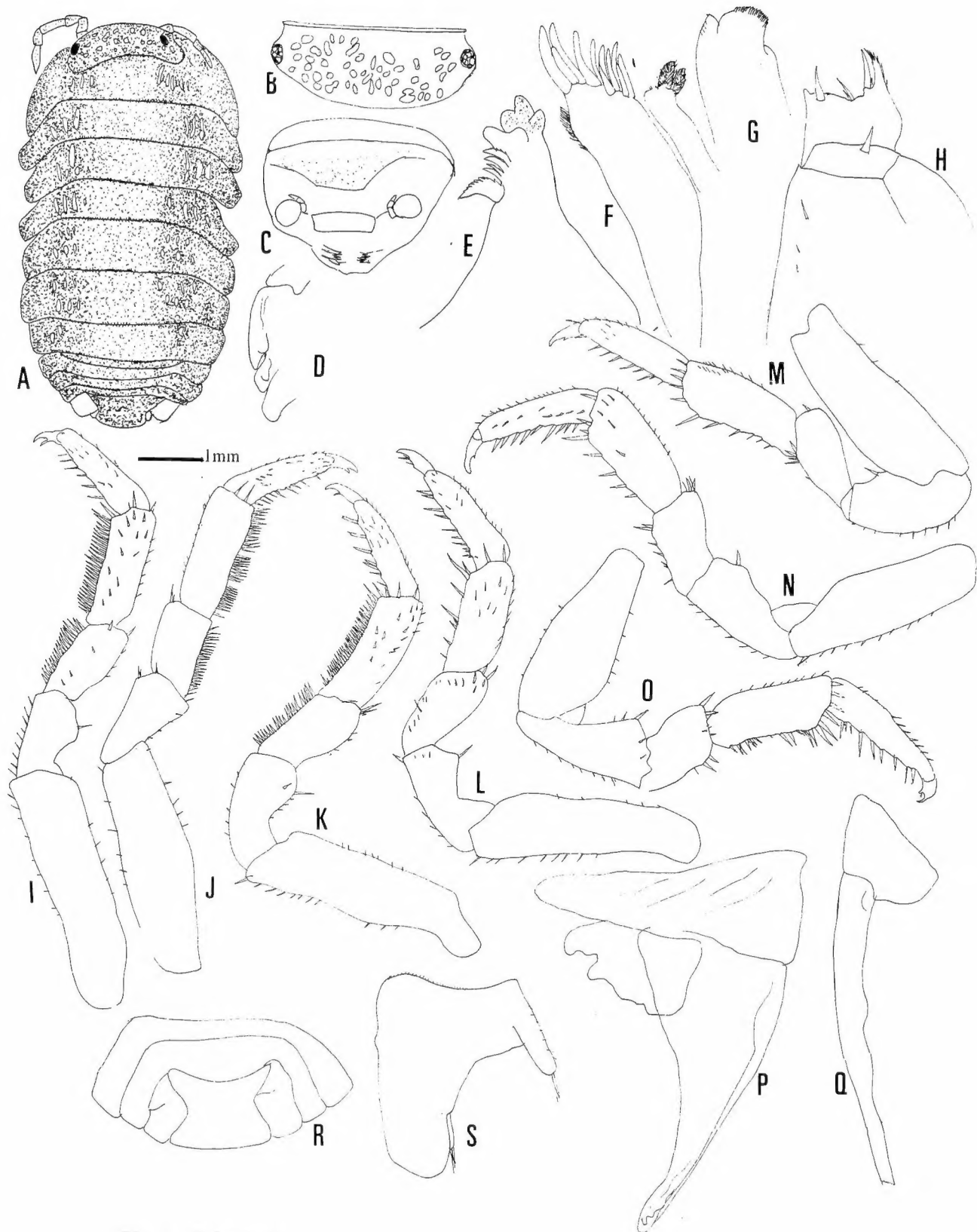


Fig. 7. *Cubaris* sp.

A: Dorsal view. B: Cephalon, dorsal view. C: Cephalon, frontal view. D: Ventral view of Pereopods 1~3. E: Right mandible. F: Maxillula. G: Maxilla. H: Maxilliped. I~O: Pereopods 1~7. P: Male pleopod 1. Q: Endopod of male pleopod 2. R: Pleotelson, uropods and pleopods 4~5. S: Uropod (All: Male specimen from Susupi).

carpus 1.6 times as long as merus, with 36~40 setae on inner margin; propodus a little shorter than carpus, with 6 setae on inner margin. Pereopod 2 (Fig. 7J): basis 3.3 times as long as wide, ischium 9/20 as long as basis; merus 1/3 as long as basis, with 20 setae on inner margin and 2-3 setae at outer distal angle; carpus 1.6 times longer than merus, with 45~50 setae on inner margin; propodus 4/5 as long as carpus with, 9 setae on inner margin stylus. Pereopod 3 (Fig. 7K): basis 27% as long as wide, with a larger seta at inner distal area, 12 setae on inner margin and 8 setae on outer margin; ischium 55% as long as basis, with 6~7 setae on inner margin and 5~6 setae on outer margin; merus 3/4 as long as ischium, with many setae on inner margin and a seta at outer distal angle; carpus 1.25 times as long as merus, with many long setae on inner margin and 4~5 setae on distal margin; propodus as long as carpus with 6 setae on inner margin, 3 of which bifurcated and the remaining ones are simple. Pereopod 4 (Fig. 7L): basis 3.6 times as long as wide; ischium half length of basis, with 5/6 setae on inner margin and seta at sternal area; merus 7/10 as long as ischium; carpus a little longer than merus, with 8 setae on inner margin and 2~3 setae on distal margin; propodus a little shorter than carpus. Pereopod 5 (Fig. 7M): basis 3.3 times as long as wide, with 3 setae at inner distal angle; ischium 3/5 as long as basis, with 8~9 setae on inner margin and a seta at outer distal angle; merus 4/5 as long as ischium, with 3 setae on inner distal angle and a seta at outer distal angle; carpus 1.5 times as long as merus, with 7 setae on inner margin, 3 setae on distal margin and many setae along outer margin; propodus 4/5 as long as carpus, with 8 setae on inner margin. Pereopod 6 (Fig. 7N): basis 3.2 times as long as wide, with 10 setae on inner margin and a seta at inner distal angle; ischium 2/3 as long as basis, with 10~12 setae on inner margin and a seta at outer distal angle; merus 3/4 as long as ischium, with 6 setae on inner margin and 3 setae at outer distal angle; carpus 1.5 times as long as wide, with 5 setae on inner margin, 4~5 setae on distal angle, 14~16 setae on distal margin, propodus as long as carpus, with 10 setae on inner margin and 20 setae on distal margin. Pereopod 7 (Fig. 7O): basis 2.5 times as long as wide, with a seta at inner distal angle; ischium 2/3 as long as basis with a seta at outer distal angle; merus rather short, less than half length of merus, with more than 6 setae on distal margin; carpus as long as ischium, with 12 setae on inner margin, 10~16 setae on outer margin and 6 setae on distal margin; propodus, as long as carpus, with 7 longer setae on inner margin and 10 shorter setae on outer margin. Pleopod 1 (Fig. 7P): endopod straight with 2 teeth at tip; exopod. Pleopod 2 (Fig. 7Q): endopod slender but unfortunately apical part broken. Uropod (Fig. 7R and S) white: basis wide; endopod slender; exopod very narrow.

Remarks: Only a single imperfect specimen was available for the study, therefore I refrained to establish a new species.

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